

The most definite conclusion indicated by the observations is that enhanced lines of iron, chromium, and titanium appear as high-level lines in the chromosphere, and that the corresponding Fraunhofer lines are generally enfeebled in the spectra of sun-spots.

[NOTE, April 28.—In *Bulletin* No. IV. of the Kodaikánal Observatory, received since the above paper was read, Mr. Michie Smith records two observations of the obliteration of 6247·77, one of 6347·31, and one of a line at 6084·32. It is interesting to note that the latter is described by Young as a faint high-level chromospheric line, though it is not yet included in my list.]

The Partial Eclipse of the Sun 1906 February 22, observed at Adelaide. By Sir Charles Todd, K.C.M.G., F.R.S.

(Extract from a letter to A. M. W. Downing.)

We observed the eclipse as follows :—

	h	m	s	
First contact	5	58	58	Considered good.
Last contact	6	58	42	Not good, Sun too low and limb very badly defined.

Adelaide standard times (9^h 30^m East) of February 23.

Observatory, Adelaide :
1906 February 26.

On the Part played by Contrast in the Appearance of the Dusky Areas of Mars. By E. M. Antoniadi.

In his valuable "Observations of *Mars*, 1903" (*Monthly Notices*, vol. lxxv. No. 8, June 1905, p. 840), Major P. B. Molesworth, R.E., has written that if my theory of contrast be "pressed to extremes it becomes a most dangerous argument. If we carry it to its logical conclusion we shall have a *Mars* deprived of all 'nuances' of light and shade, both light and dark markings being broad masses of uniform tone unrelieved by any half-tones or delicate shading."

Now in reply to this it is perhaps unnecessary to remark that any physical hypothesis is destined to account for some definite phenomena, and no others. The utility of pressing a theory to extremes is therefore questionable to my mind. At the same time Major Molesworth's "logical conclusion" from

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the contrast hypothesis, that it would give absolute uniformity to the dusky areas of *Mars*, is gratuitous, and, moreover, in direct antagonism to facts, since contrast, as shown by observation and experiment, tends to intensify the edges of *all* duskinesses, and this quite independently of their albedo.

Major Molesworth has obviously misunderstood the expression "rough evenness of tint"* which I have applied to some dusky areas of the planet. The word "evenness" was used only in opposition to the unevenness resulting from Signor Schiaparelli's sea-girding "canals," which I have attributed to contrast.† That I never meant for a second that the grey markings of *Mars* were even in tint is evident (a) from the above expression, "rough" evenness implying, of course, a somewhat checkered structure of the shadings; (b) from the statement made in the very paper in which my contrast theory was framed in 1903, and running thus: "That the intensity of the grey spots is far from being uniform no one will deny";‡ and (c) from my numerous published maps of *Mars* from 1892 to 1903, and particularly the small chart accompanying the 1903 considerations on contrast, in which the intensity of the shadings is shown to vary most unmistakably, and by delicate gradations, from the faintest half-tones to the darkest areas.§ Such converging evidence goes far to establish beyond doubt the uselessness of the attempt to invalidate the contrast hypothesis by straining it to conclusions of a baseless and inaccurate character.

But Major Molesworth raises a far more interesting question when doubting that the intervention of contrast and of fatigue of the eye can be nugatory to eye training during the successive apparitions of *Mars*.|| Examples, however, tending to prove the reverse are numerous. In 1890, for instance, Signor Schiaparelli's persistent efforts had reached, after several weeks of real eye-training, what looks like the culminating point in the visibility of delicate objective detail when Sinus Sabæus appeared with a wavy, irregular outline and a fairly uniform intensity (fig. 1). But what, may we ask, was the result of further observation? The disappearance of detail, the brightening of the inner part of the Strait, and the intensification in two very dark perfectly straight lines of the N. and S. borders (fig. 2).

Inasmuch as Major Molesworth considers that eye-training goes on steadily improving during a given apparition, he must logically admit the rude form of 1890 June 20 as giving a

* *English Mechanic*, 1903, No. 2016. † *Knowledge*, 1903, pp. 247, 248.

‡ *Ibid.* p. 248.

§ *Ibid.* p. 249.

|| Here Major Molesworth asks if contrast is applicable to the duplicity of *Jupiter's* belts. These I consider objectively double in the immense majority of cases. There can be no comparison between the solid globe of *Mars* and gaseous *Jupiter*, whose rotation period varies with latitude. On *Saturn* contrast gives rise to the "square shoulder" appearance and to Dr. Terby's white spot on the rings.

truer view of Sinus Sabæus than that of May 16, the atmospheric definition being excellent in both cases and the probability of objective change on such a vast scale being out of question. But the evidently artificial character of such an assumption is avoided by the theory of contrast; considering fig. 1 to represent the best view of Sinus Sabæus, and the irregularly indented outline to look like the natural edge either of a vegetation tract

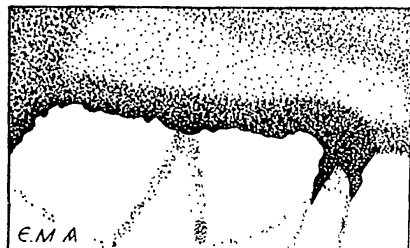


FIG. 1.
May 16.

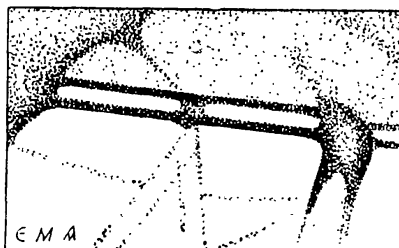


FIG. 2.
June 20.

Appearances presented by Sinus Sabæus in 1890 according to Signor Schiaparelli.

or of water, or a combination of both, fig. 2 corresponds to the vagaries of an exhausted retina, since, according to contrast, fig. 1 will appear like fig. 2 after a very prolonged fixity of gaze.* I have, however, an open mind; and the day when Major Molesworth will have succeeded in demonstrating that the amelioration of telescopic seeing by eye-training involves the positive *loss* of planetary detail he will have established his contention on a strong basis.

Observations of Comet a 1904, from Photographs taken with the 30-inch Reflector of the Thompson Equatorial and the 13-inch Astrographic Refractor at the Royal Observatory, Greenwich.

(Communicated by the Astronomer Royal.)

The following positions of Comet *a* 1904 were obtained from photographs taken with the 30-inch reflector, except that on 1904 April 17, which was taken with the 13-inch astrographic refractor. From two to four exposures were made on each plate, the duration being 3^m in 1904 April and May, 2^m in June, afterwards increasing to 7^m in October. The last photograph, on 1905 May 8, has two exposures of 20^m each.

* I attribute to a fatigue of the retina the disappearance of the faint half-tones of the N. hemisphere of *Mars* from the charts of Signor Schiaparelli and Mr. Lowell. The tired eye sees better the outlines than the central regions of faint duskinesses.

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